Accepted Manuscript

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PII: S0924-0136(15)30061-3
DOI: http://dx.doi.org/doi:10.1016/j.jmatprotec.2015.07.009
Reference: PROTEC 14487

To appear in: *Journal of Materials Processing Technology*

Received date: 28-2-2015
Revised date: 28-5-2015
Accepted date: 12-7-2015

Please cite this article as: Jin, Junsong, Wang, Xinyun, Deng, Lei, Luo, Jiancheng, A single-step hot stamping-forging process for aluminum alloy shell parts with nonuniform thickness.Journal of Materials Processing Technology http://dx.doi.org/10.1016/j.jmatprotec.2015.07.009

A single-step hot stamping-forging process for aluminum alloy shell parts with nonuniform thickness

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Abstract: In this study, a single-step hot stamping-forging process using a counter punch was proposed to produce pan-shaped shell parts with nonuniform thickness distributions, which are often used in satellites. Through FE simulations, the effects of die temperature, counter punch initial interposition length and counter force on the part thickness were examined. It was found that the material flow is divided at a flow dividing surface (FDS) which moves in the wall during forming. The maximum bottom thickness and nonuniformity were found to be closely related to the counter force and initial interposition length. Base on the simulation results, experiments were carried out using sheet blanks with initial thicknesses of 4 mm. After stamping-forging deformation, the part bottom was successfully thickened to 4.3 mm while the wall was thinned to 2.5~2.7 mm.

Keywords: Hot stamping-forging process

Integrated plastic forming

Aluminum alloy

Sheet metal

Sheet bulk metal forming